

Club Repeaters W6RGG/R 147.24+, 442.200 (107.2PL)

**NCCC****JUG****NEXT NCCC MEETING!****DATE: MONDAY, SEPT. 8th****TIME: 6:30 P.M.****AT THE****OLD SPAGHETTI FACTORY****JACK LONDON SQUARE!!****DIRECTIONS BELOW!**

The restaurant requires a head count by Friday September 5th, so please contact Kenny, K2KW with the type and quantity of your dinner request. Contact Kenny at: 510-210-0410 (H) or Email:

**ken.silverman@airtouch.com.**

Schmoozing will start at 6:30, and there will be a cash bar. Dinner will be served in the banquet room at 7:15, and the program will begin during dinner. There are two choices for dinner: Spaghetti and Meatballs for \$9.00, and Chicken Marsala for \$10.00. Meal prices include: dinner selection, sourdough bread, green salad w/Italian dressing, coffee, tea, milk, or soft drink, spumoni ice cream, tax, and gratuity.

The Old Spaghetti Factory  
62 Jack London Square  
Oakland, CA  
Tel: 510-893-0222

(From the North Bay & East Bay): Take I-880 Southbound, and take the Jackson Street Exit. Go right on Jackson. Then go right on 4th Street, and left on Webster. The restaurant is located 2 blocks ahead at the intersection of Webster and Embarcadero.

(From the South Bay): Take I-880 Northbound, and take the Oak Street Exit. Turn left on Oak Street, then right on Embarcadero. The restaurant is about 4 blocks ahead on the left side of the street.

Parking is on the street if you can (which should be no problem on a Monday night), or in the PAY parking lot directly across from the entrance of the restaurant. The restaurant will reimburse the first hour if you go in the PAY parking lot.

It would be a really good idea to car pool, so call up friends and go with them! Call Andy, AE6Y, who will be organizing car pools. The program will be a roundtable on CQP operation.

**NCCC OFFICERS**

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**DUES WAY PAST DUE!**

**TAKE A LOOK AT YOUR MAILING LABEL. IF IT'S ORANGE, THEN YOUR DUES ARE OVERDUE! TAKE THE TIME TO FILL OUT THE FORM ON PAGE 9, WRITE YOUR CHECK, AND MAIL IT TO THE ADDRESS SHOWN ON THE FORM! (DO IT NOW, OR THIS IS YOUR LAST JUG!)**



# ANDY'S DANDIES

## Sweepstakes - We Gotta Try Harder!

Our biggest challenge for this year is to regain our natural preeminent position in the Unlimited Sweepstakes competition. As most of you know, we won from 1992 through 1995, but got whumped big time last year by Potomac Valley Radio Club.

This year we are calling on every member to do his or her share. We need YOU to get on both modes. Any decent effort will net 100k points in either mode - that's only 650 QSO's or so. If your neighbors will let you, run high power. The contest is much more fun that way, and your score will be much higher. We can only win SS through major participation by club members, not through mega-scores by super stations. That just can't happen in SS, so we need everyone to pitch in to take back our rightful mantle.

Bob, K6XX, is updating the Sweepstakes Handbook, last published in 1994. This is a marvelous compendium of helpful information very professionally presented. You can view it on line and download it from Bob's web site:

<http://www.jps.net/K6XX/sshb>

It's a password protected ".pdf" file that can be viewed or printed from Adobe Acrobat. (Note that you can download a free copy of Acrobat Reader from Adobe's site (<http://www.adobe.com>). It's confidential, for NCCC members only. The password for the .pdf file is on your mailing label (don't share it!)

The handbook is over 40 pages, in color. It's beautiful on-line, or you can print it to a color printer if available. It prints out fine in black and white also. If you want a hard copy and can't print one, call or e-mail me and I'll send you one free. This is a great book to curl up with!

A copy of my letter to the members contained in the Handbook is printed elsewhere in this JUG. Here's the pome from the SS Handbook:

The Club needs everyone's score  
Both modes, or I will be sore.

So turn on the amps

And we'll be the champs

In the big dog's class once more!

## New SS awards

The Board of Directors has authorized new incentive awards for SS. These are:

**KB1000, KB2000.** As usual, we have KB awards in the form of plaques for making a total of 1000 or 2000 contacts in SS (one or both modes.) Last year we

had very few KB2000 awards, but this year we should have lots more.

**New award:** a nifty letter opener a la WRTC for 250 total QSO's, one or both modes

**New award:** an individualized mouse pad for 500 total QSO's, one or both modes (in addition to the letter opener).

These are great awards, well worth striving to achieve. I use my mouse pad from 1995 SS every day - it's great!

## And - Don't Forget CQP!

Coming up the first weekend of next month is our own fabulous contest, the California QSO Party. This has been my favorite contest for years. I've entered every year and have a bunch of wine bottles to show for it (very good wine, also -thanks to Bruce Butler, W6OSP).

Plan to get on. You'll have a ball. This year, alas, I myself will have to miss it, for the first time since 1992. My wife and I will be on a trip in Tibet, Bhutan and Nepal, and I don't think I can get reciprocal operating privileges. Darn! Unfortunately, there are only two "windows" for visiting Tibet, set by summer monsoons and fierce winter weather. Since we didn't plan ahead early enough to go in May, it's got to be October. I'm hoping to atone for this by making a major effort in SS, with new antennas, and running high power for the first time in several years.

BTW: this makes the low power division of CQP wide open. I won it last year, after finishing second to now SK W6UQF, so the handsome wall plaque is there for the taking.

Our intrepid contest chairman, Bob, N6TV, will be ensuring, as usual, that all 58 counties get on the air. Please contact him if you have any interest in doing a county expedition to help out the cause.

## NCCC Website

While you're on the web, cruise over to our own site "<http://www.contesting.com/cqp>." Dave, N6NZ, has been working some more of his magic, and there is even more and better stuff there than before. There's a cliché applied to hobbyist efforts: "Don't quit your day job," but judging from our web site, maybe Dave can!

## CQP/SS Software updates

I've been spending many hours updating my CQP and CQPWIN software for logging CQP, SS and WPX. New versions 5.5 of CQP DOS and 5.0 of CQPWIN for Windows are available for the asking from me or WA6SDM, and will shortly be loaded onto Compuserve's Ham Forum and to our CQP web site

(<http://www.contesting.com/cqp>)  
for download.



## DANDIES (cont'd)

I started out just wanting to add a new section to SS (the nutty NL section), but that got me wanting to change how SS logs were stored, and that required a conversion routine for former logs, etc. Anyway, the DOS version is now updated for SS, and also has the CQP mults displayed by call areas, instead of alphabetically. It still dupes, logs, shows rates, sends CW exchanges and CQ's, etc. as before, and comes with documentation.

With the Windows version, I got carried away with revisions. First, I made it into more of a standard windows program, including a complete help system in Windows format with hyperlinks, etc.

Some new features include "InstaMatch", which displays matching callsigns in the current and/or former logs as you type in a callsign. The Digital Voice Keyer has been further refined. It now sends up to 9 messages (e.g., CQ's, QRZ's, etc.) using the function keys, and sends callsigns and exchanges using your SoundBlaster card. For the callsigns, you can now send either phonetics or letters, and the program can decide which to send automatically depending on the callsign typed. In all modesty, I think I've just about solved the "robot voice" problem; it sounds very natural, and I will happily use it on the air.

Anyway, as any of you programmers knows, this whole effort took much longer than I had thought, and led to a lot of late night stints. See you all September 8th!

73, andy

## THE TV GUIDE

It's Party Time! What party? The California QSO Party, of course. Spread the word to your friends. Have them check out the NCCC Web Page for the official rules and latest info, at:

<http://www.contesting.com/cqp>

Can't remember it? No problem, just go to Yahoo or AltaVista and search for "California QSO Party."

**RESERVE YOUR COUNTY!** Send DX PacketCluster mail to N6TV or e-mail to

**N6TV@VNET.IBM.COM**

if you want to activate a rare county for CQP. As an experiment this year, the Web site will be updated with a list of who is going where. Once again, we need to activate all 58 counties so that everyone can go for the "Clean Sweep."

The next NCCC meeting is our CQP kick-off. We'll go over operating strategy for both big guns and little guns, plus some tall tales from CQPs long past. Don't miss it.

Also, we will soon be contacting each club member by telephone and/or e-mail. All we want to know is: will you help us win back the Sweepstakes gavel this year? Everyone needs to make as many QSOs as possible if we are going to beat PVRC. Just a few hundred QSOs on each mode, by every member, and we've got it in the bag.

What if you don't have a station? No problem. Let me know, and I'll find you a good one.

What if you don't have the time or energy to operate full time? Offer your station to another operator, or go multi-single. Contact me and I'll do the match-making!

Let's show PVRC who is number 1 in SS!

73, Bob, N6TV

## CONTEST CALENDAR

Sep 7 NA Sprint, CW

Sep 14 NA Sprint, SSB

**Oct 4-5 California QSO Party**

Oct 25-26 CQ World-Wide Phone

**Nov 1-2 ARRL Sweepstakes, CW**

**Nov 15-16 ARRL Sweepstakes, Phone**

Nov 29-30 CQ World-Wide CW

Dec 5-7 ARRL 160 meter

Dec 13-14 ARRL 10 meter

## CONTEST SCORES RECEIVED

(Remember to send claimed scores to N6TV via packet, mail, or to [n6tv@vnet.ibm.com](mailto:n6tv@vnet.ibm.com))

### North American QSO Party, CW

K6GT	250 x 98	24,500
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### North American QSO Party, Phone

K6BZ	796 x 117	93,132
K6GT	329 x 88	28,952



# Muns' Meeting Minutes

Our August meeting sported a double-header program with Bob, N6TV, divulging how to effectively search and pounce and Bruce, N6NT, doing a show n' tell on cheap, fun DXpeditioning.

Actually, Bob also used the show n' tell technique by bringing a video tape of him working the September 1994 CW Sprint contest. This was an excellent demonstration of various search and pounce (S&P) tricks by the master himself in a contest that is optimized for S&P.

First, the Sprint contest itself must be understood in order to learn how S&P is applied there. In the Sprint, you can only work two stations on a given frequency before moving at least 1KHz to work the next station or at least 5KHz to call CQ. So, the usual rhythm is to find a new station to work and then stay on the frequency and work a station that calls or answers your subsequent CQ. Then you move and find another station you haven't yet worked on that band.

So, over the years, Sprint operators have settled into an informal agreement on the order of items in the exchange. The station being called will sent the caller's callsign followed his own callsign followed by the exchange. Then the caller sends the other station's call followed by his exchange followed by his own callsign. This tells anyone listening where the stations are in the exchange sequence and who is staying on the frequency for the next QSO--the last callsign sent. The original station being called then QSY's and a new third station calls the original "caller" (now, the "station being called") and the sequence repeats.

Now, on to some S&P tips. First, Bob recommends that you keep tuning when you find a sequence that is just starting, even if you need the station who will remain on the frequency for the next QSO. Chances are that you will find one just ending only a KHz away and begin your next contact quicker. If, however, you do NOT find a good QSO within a few seconds, zip back to the frequency where the QSO should now be ending--in other words, store in your mind the timing of QSO's as you tune through them and jump back to one whose timing meshes with your availability for a QSO. This is good S&P technique in general, not just in the Sprint.

Be sensitive to your CW speed and increase or decrease it depending on circumstances. For instance, crank it up to 50+ if you are sending an exchange to someone who knows you and what most of your

exchange will be. For an unknown station, adjust your speed to his in order to minimize the necessity of fills.

Pause for a split second at the end of a QSO before calling CQ. Almost always a station is waiting to call you and there is no sense holding up the contact by an unnecessary CQ. If you are the one calling, or even tail-ending, send you entire call. This, again, will ave time and speed up the contact since the station you are calling must get your callsign before sending the exchange properly.

Of course, computer logging is nearly a given these days and it affords you the opportunity to spend more time tuning and listening for your next QSO rather than tending to the administrative tasks of the contest.

Now, if you want to operate on the "busy" end of the pileup, take some advice from Bruce on how to have a ball without spending a lot of money on a contest DXpedition. Lest any of you need any convincing, Bruce's credibility is high after overwhelmingly winning the Low Power DX honors in this year's ARRL CW DX Contest from Panama. Even more amazing is that his entire station, antennas included, were within his allotted carry-on and checked luggage! Of course, there was no room for clothes or a toothbrush, but these things are superfluous while contesting!

First of all, Bruce constructed a compact and lightweight trapped dipole using RG8X. This may not strike you as a very impressive antenna, but check the contest results in this the August QST! As Bruce so rightly points out, being in a semi-rare contest location makes your signal 10db louder than it normally would be, so large antennas or high power are really not needed. Especially if you pick the ARRL DX contest where DX is working the US, your antennas never need to rotate anyway. It does help to get the dipole, usually in an inverted-V configuration, as high as possible. For this, Bruce uses a sports sling shot, monofilament fishing line with 1/2 to 1 ounce weights and nylon construction line (string really, used for chalk lines and layout of building construction--get at Home Depot). A weight is attached to one end of the monofilament that has been carefully laid out on the ground so as not to tangle or catch when being propelled behind the weight which is launched out of the sling shot over the targeted HIGH tree branch or other temporary support. Always orient yourself with the sun behind you so you can see where the weight is going! Now, the nylon chalk line is attached to the monofilament and pulled up over the support. Finally, some heavier nylon or dacron line is attached to the chalk line and pulled into place. A good trick is to put a small pulley on the high end of this last



## (More Muns' Minutes)

line that has a second piece of the heavier line running through it. Once the pulley is as high as you can get it, this second line is then used to pull the center of the dipole up to the pulley.

If you insist on a beam, then it is possible to pack a 40' mast and a tribander into a 4' long tube only 6" in diameter. There's even a local antenna manufacturer who makes such DXpedition packages as standard products! If you use a PVC tube, be sure to pack the ends with newspaper before attaching the end caps. Odds are greater than 1:2 that the caps will be broken in transit otherwise!

For equipment, Bruce typically uses a transceiver that has an internal AC supply and can be run off 12 volts DC as well. An amplifier is not necessary for a weekend DX contest station in Central or South America or the Caribbean. However, Samsonite makes a hard-sided case with wheels and retractable handle that just fits an Alpha amplifier! A small duffel can hold all the tools, supplies and parts you will need. Two screwdrivers, pliers, an adjustable wrench, soldering iron and an Xacto knife are about all the tools you really need. A neat trick Bruce uses for items like the key paddle is a Tupperware or RubberMaid container which is lightweight, strong and comes in many sizes to accommodate your needs. Finally, select a location that is easy to get to and only one propagation hop from the US. It doesn't have to be exotic to be fun. There are many close-by countries in our hemisphere which are lightly active during DX contests. Bruce never worked the pileup down and couldn't have worked so many stations from stateside without a multi-tower extravagant station. Consider this for the 1998 ARRL DX contest and have the time of your life!

On another note, we held the meeting at the South Beach Yacht Club on Pier 40 in San Francisco as an experiment in alternative meeting locations. The feedback from all present was an emphatic "thumbs up", so we plan to return there for some of our future meetings. The members commuting in from the East Bay and as far away as Sacramento found the drive quite easy and traffic-free.

Bob, K3EST, made it in from Davis in only 70 minutes as did Rob, K6RB, from Santa Cruz. Kenny, K2KW, says it was an easier trip for him from the East Bay than if the meeting were held IN the East Bay! Basically, it is a counter-commute for most people and it is all freeway travel until you get to The Embarcadero

... which is vacant! We had a delicious fish or chicken dinner catered by The Pier 40 Roastery & Cafe for only \$10. The ambiance of the yacht harbor gave a welcome change of venue, too. See you next time!

73, w0yk

## Meeting Notices by e-mail

If you have not received meeting notices to your E-mail address, then I don't have your correct address. Please send me your E-mail address, so we can contact you when needed for NCCC business. In particular, the following members' E-mail addresses do not work--please send me an update:

## CALL

AA6T  
AF6S  
K6ST  
K6TMB  
KB6VVX  
KE1FO  
N6CCL  
N6JT  
N7TN  
N7TR  
NB6G  
NF6S  
NP4IW  
WE6F

Also, please DO NOT use the NCCC E-mail distribution list which you may receive with club E-mail messages. Members' E-mail addresses are to be used by the Secretary only for club business. If you have a message or information which you would like to send to NCCC members, please send it to me first and, if it's appropriate, I will forward it to the membership. Thanks for your help!

Ed Muns, W0YK  
w0yk@msn.com



## A Message From Our President

In the 1994 edition of the Sweepstakes Handbook, then president Bruce Sawyer (N6NT, ex AA6KX) summarized some relevant SS history as follows:

"This revised edition of the *Northern California Contest Club's Sweepstakes Handbook* has been thoroughly updated to reflect the current realities of SS operation from California. You will find it an invaluable collection of hints and tips to help you get the most out of these fun contests. Read through it carefully and you will find an abundance of ideas to help boost your SS totals.

"As you will soon see, the November Sweepstakes is an old tradition of the NCCC. This club was founded over twenty years ago because a group of determined testers wanted to be able to submit a club entry for Sweepstakes but had no means for doing so without founding their own club. Since that founding, NCCC has won the club competition in November Sweepstakes a total of nine times. After winning consistently for a six straight years, the Club began to take those victories for granted. That, of course, is when we ceased winning. But a couple of years ago we decided to return to our roots, and now we have won the Unlimited Club category two years in a row. QST had this to say about club competition in the 1993 Sweepstakes:

*"The Affiliated Club Competition might as well be called the California Club Competition! The Northern California Contest Club repeated as champion of the Unlimited Club category. With 80 entries totaling more than 7 million points, the NCCC appears to be beginning another SS dynasty."*

Here's what happened after those words were written:

- 1994 — Inspired by the presidential message and guided by the SS Handbook, we turn in a fabulous 11.2 million points from 128 logs, easily defeating the SCCC at 6.9M. QST says NCCC is "in the midst of its second 'dynasty.'"
- 1995 — Getting a bit lazy, we narrowly win, posting 8.0M from 99 logs, just beating the PVRC's 6.7M from 98 logs. QST presciently says, "Can anyone challenge them?"
- 1996 — Tired, worn out from sponsoring WRTC, and complacent, we barely eke out second place, with 7.4M points from only 77 logs. PVRC kicks our butts big time with 8.9M points from 117 logs. YCCC came in third at 6.1M points. QST only noted that our four-year winning streak was broken, politely declining to rub it in.

Why did we get embarrassed last year? The answer is obvious — lack of participation. While we won in 1993 with only 52 logs, last year at our average score, we would have needed about 95 logs to beat PVRC's 117 entries (we averaged 94k per log to their 76k). Unlike WPX, SS is the ultimate egalitarian contest. A few large scores won't win the unlimited class, only large-scale participation will.

This year we want to get that gavel back! We need YOU to help out. Operate as much as you can, enter both modes and use high power if you can. We need YOU to make as serious an effort as YOU possibly can. If we get 100 logs at 100k per log, we'll be tough to beat, but PVRC may be trying to top last year's result (and the East Coasters were given a bit of an edge when the ARRL foolishly created two new, largely unpopulated, sections in their backyards.) If you did 100k last year, shoot for 125k. If you hate SSB or CW, get on in that mode anyway and do what you can.

Now that we are #2, we've just got to try harder. I don't want to stay #2. It's up to each of us to defend the club's honor. Let's get that Unlimited Class gavel back where it belongs — with NCCC!

73,

*Andy Faber, AE6Y*

Andy Faber, AE6Y

President, Northern California Contest Club



# Visual CW Tuning Indicator

Bob Wolbert, K6XX

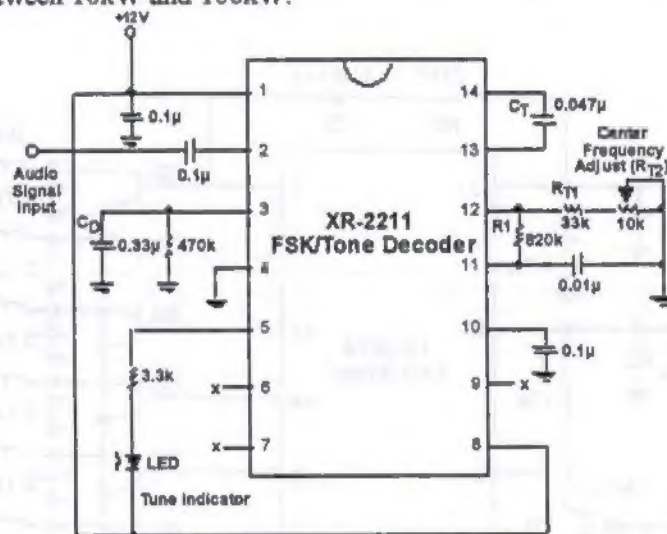
One of the FT-1000MP "bells-and-whistles" that I really like is the CW Center Tuning indicator. This feature allows you to quickly zero-beat a received signal, even if you have poor tone perception ("tone deaf"). This feature is readily adapted to any rig by adding a tone decoder, which is a simple, low cost, single-IC function.

## Circuit Description

The circuit presented uses a XR-2211 FSK decoder, the same device used as the demodulator in most first-generation packet TNCs. It connects to the audio output of your transceiver; the line-out or phone-patch output of some rigs is ideal. The XR-2211 is a phase-locked loop IC using a resistor and capacitor for frequency adjustment, and other resistors/capacitors for independently setting the detection bandwidth. It is available at the local electronic "junk" stores and is manufactured by Exar, Raytheon, and JRC/NJM. Digi-Key lists them for \$1.59 in single piece quantities.

This tuning indicator requires a clean +12V supply for operation. With the component values shown, the tone decoder center frequency will range from below 500Hz to above 600Hz; component tolerances have been considered. The capture bandwidth of the tone decoder is about  $\pm 25$ Hz.

If you prefer a lower center frequency, increase RT and/or CT. Detection bandwidth is inversely proportional to R1. Tone detect lock time is proportional to CD. For best results, use a good quality, temperature stable capacitor for CT. Mylar, polystyrene or other poly- chemistries will work much better than standard disc ceramics. Also, keep the total value of RT1 + RT2 between 10k $\Omega$  and 100k $\Omega$ .



## Tuning and Operation

Connect the audio input to the speaker, line out, phone patch out, or similar connector on your receiver/transceiver. With its high input impedance, this tuning indicator does not noticeably load down even line-level audio outputs. Tune in a constant carrier or calibrator signal of the desired pitch and increase the audio gain higher than normal. Rotate RT2 to its fully counterclockwise position, then adjust clockwise until the LED first fully illuminates. Note this shaft position. Continue turning RT2 clockwise until the LED turns off. Reverse the rotation until the LED again just lights without flashing. Now center the shaft between the two "first light" positions. Reduce the audio gain to normal listening levels and verify the LED remains on.

After completing the tuning process, the LED will illuminate as you get within about 25Hz of a signal. It will flash on and off a bit with the incoming signal; do not expect to copy code this way, however. There is a trade-off between detection speed and false triggering. The component values shown are what I consider the best compromise. The detector takes a few dot lengths to light and, once lit, a few dot lengths to shut off (at 35 WPM or so).

This circuit helps me tune in stations when searching the band. I find it especially useful when (attempting) two radio contesting. This way I can find and tune in a CQer, getting fairly close to zero-beat by watching the light, while concentrating most of my attention on the run rig.

Now, I have another of the FT-1000MP features on my "old" rig at a small fraction of the price.



# ICOM Automatic Band Select and Serial Interface

de Bob Wolbert, K6XX

This project is an interface box for ICOM rigs that includes a band output port and a CI-V-to-computer serial interface. The band output port drives things like relay-switched DuneStar band filters (Model 600, for example), remote coax switches, etc., and does not require a computer. The CI-V interface allows rig control via computer, and makes logging programs like TR-Log and CT really shine.

Figure 1 is the band select driver portion schematic. When I designed it, I thought I was being really clever—using an IC designed as a consumer-audio output meter as an analog-to-digital converter with an external reference and controlled-current output drivers. Then came the April NCCC meeting: N6TV brought in his OH-made solid state DXpedition kW amplifier, and there in the diagrams was an Icom interface virtually identical to my “clever” circuit. So much for unique ideas...at least this means this design should be easy to duplicate and get running for other builders! One major difference from the commercial design is that Figure 1 properly decodes 30m. Unfortunately, other WARC bands are not separated (12m decodes as 10m; 17m decodes as 15m) because Icom’s voltage level scheme uses the same voltage for these band pairs.

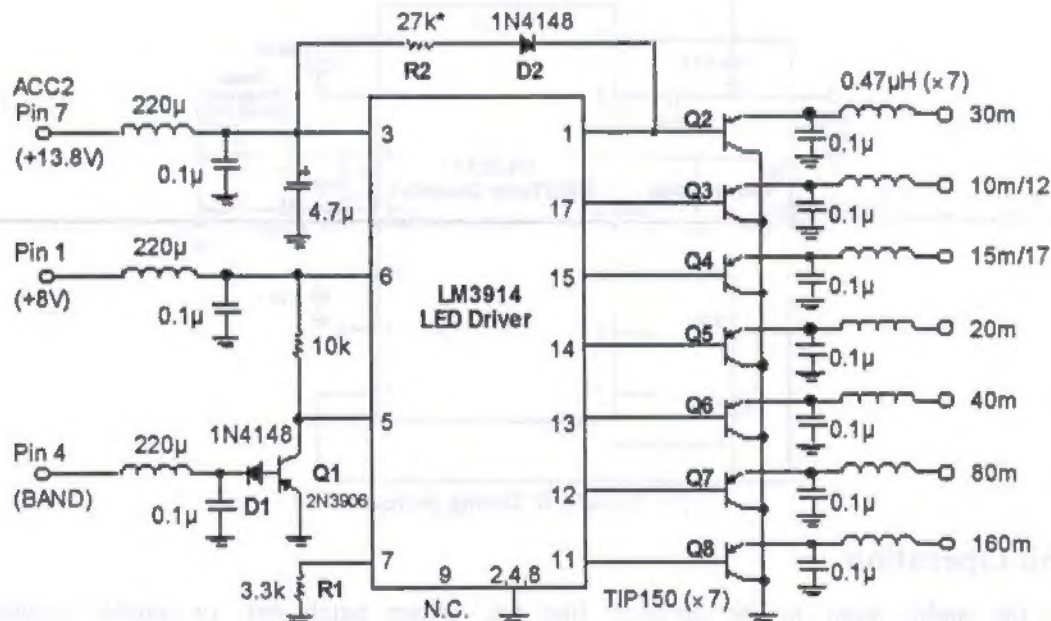


Figure 1. The Icom Band-Select Decoder

The band decoder takes three inputs from the ICOM rig: power, a reference voltage of +8V, and the “BAND” voltage. This band voltage varies from 0V for 30m to over 7V for 160m (see the Table, below, for values measured on my particular rig). The LM3914 is designed as an LED bar graph meter for low-cost consumer audio electronics. It is used in its “moving dot” mode instead of the bar graph mode, so only one output is active at a time. Note that no base current limiting resistors are needed for the output transistors: the LED driver functions as a current source which provides the needed base current limiting. Base current drive is set by R1. Q1 and D1 act as a level-shifter, raising the zero-volt 30m level about a volt so that the first “dot” is active. R2 and D2 compensate for a LM3914 “funny”—the first output draws several hundred microamperes of current even when the other outputs are selected. This is enough to turn on Q2 slightly. R2 compensates by providing another path for this current. Its value might need tweaking for individual LM3914s and different supply voltages. D2 prevents reverse current flow from the relay into the rig.



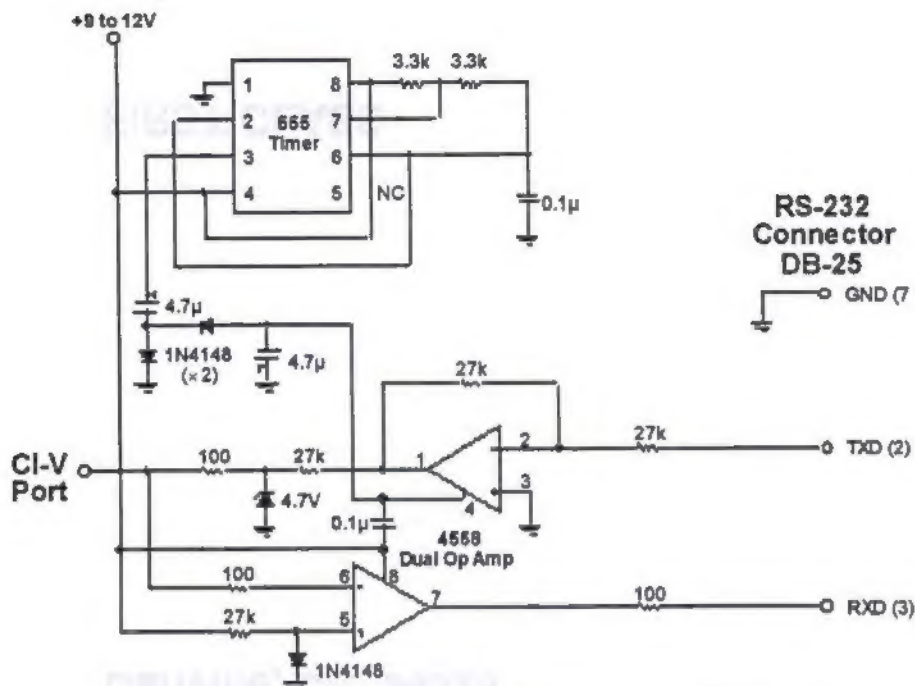


Figure 2. CI-V to Serial Converter

The CI-V-to-computer serial interface schematic appears as Figure 2. It uses a low-cost dual op-amp and a zener diode for level conversion. A 555 timer is used as an oscillator and charge pump to produce the negative voltage. Since power is already available from the band decoder port, no attempt at self-powering through the RS-232 port is made. You could probably derive the negative supply from the serial port and eliminate the 555 charge pump. ICOM uses a unique system with bidirectional control (with multi-radio capability) through a single wire (plus ground). A standard miniature (1/8") mono phone plug connects to the radio's "CI-V" port. A normal 9-pin or 25-pin DB connector attaches to the computer's serial port.

Like most of these interfaces, getting the hardware built and connected is only part of the task; convincing the software in the computer and the radio to speak is usually much more frustrating, especially if you have not done it before with a given program or rig. You are on your own here!

The full interface unit is simply figures 1 and 2 combined. I tried to minimize the number of different resistor and capacitor values; only R1 and R2 are critical; the others may vary quite a bit without affecting circuit operation. The component cost of the full interface is relatively low: well under \$20 at Digi-Key mail order prices. You can probably build this box for under \$10 by visiting the flea market and the local "junk stores."

#### USE THIS FORM TO PAY DUES FOR 1997-1998!

Name: _____	Full Memberships .....	_____ x \$24 = _____
Call: _____	Family Memberships .....	_____ x \$12 = _____
Address: _____	Associate/Student .....	_____ x \$12 = _____
_____	Donation to General Fund .....	_____
_____	Donation to Repeater Fund .....	_____
E-mail address: _____	TOTAL enclosed .....	_____
Home phone: _____		
Work Phone: _____		

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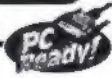


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